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WORK OF THE NEWLANDS RECLAMATION PROJECT EXPERIMENT FARM IN 1922 AND 1923

F. B. HEADLEY
Agronomist and Superintendent

E. W. KNIGHT
Junior Agronomist
Office of Western Irrigation Agriculture, and

L. E. CLINE
Associate Agriculturist
Office of Demonstrations on Reclamation Projects, Bureau of Plant Industry

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AGRICULTURAL CONDITIONS ON THE PROJECT[1]

ACREAGE, PRODUCTION, AND VALUE OF FARM CROPS

The annual crop census taken by the Bureau of Reclamation of the Department of the Interior toward the close of each calendar year has been of great value in recording the evolution of the various farm industries on the project. It is from this source that the greater part of the data included in the discussion of agricultural conditions has been obtained.

The irrigated area on the project decreased both in 1922 and 1923 from that of 1921, the decrease amounting to 1,180 acres in 1922 and 1,257 acres in 1923. Probably the adverse economic conditions obtaining during this period are responsible for this decline in the cultivated area.

[1] The Newlands reclamation project is located in western Nevada, surrounding the town of Fallon, on a short branch from the main line of the Southern Pacific Railroad. Its water supply is drawn from the Truckee and Carson Rivers.

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The alfalfa area was increased in 1922 by 1,656 acres, but a decrease of 1,733 acres was reported in 1923. It is probable that the decrease of so large an acreage during the latter year was due to the fear of the approaching alfalfa weevil, which had advanced in 1922 to a point about midway between Reno and Fernley. During the summer of 1923 weevils were found in the Fernley district, and the hay from this section was promptly quarantined from the California markets. The hay from the main body of the project, lying in Churchill County, was not quarantined, and a large tonnage was shipped out at good market prices, which helped greatly in alleviating the financial distress of many individuals.

Grasshoppers appeared in such numbers in the early summer of 1923 as to reduce very materially the yield of the first crop of alfalfa; but for some reason they died off rapidly in July, so that the two following crops were not seriously affected. The alfalfa aphids were so numerous in parts of the project in April and May that growth in some fields was completely checked for several weeks. The aphids were localized in their distribution, seriously damaging some fields close to others where the injury was slight.

The farmers of the project planted more heavily to potatoes in 1922 than in any previous year, but the drop in market value of this product in the winter of 1922–23 resulted in many instances in heavy financial loss. In 1923 the potato area was reduced by 25 per cent from that of the previous year.

The beet-sugar factory, which had been operated in 1921, was abandoned in 1922 because of the prevalence of curly-top during the preceding year. Had the factory been run the results probably would have been satisfactory, for little indication of curly-top was to be found in 1922. The fact that the sugar factory has been unsuccessful in its several attempts to start the sugar-beet industry seems to have very largely resulted from a series of unfortunate circumstances.

The factory first operated in 1911, which was unfortunate, as the curly-top appeared that year for the first time and reduced the crop yields to such an extent as to cause financial loss to both the farmers and the sugar company. The factory was operated again in 1912 with only a small acreage of beets. During this season the beets were without disease, and the crop yields and sugar content were very satisfactory. The sugar company, however, did not recover from the loss sustained in 1911, and the factory was not again operated until 1917. This time the attempt was unsuccessful because of the economic conditions then prevailing. The two factors tending to curtail production that year were shortage of labor and the high prices farmers were obtaining for alfalfa and grain. Profits on these commodities were so great that few farmers cared to take upon themselves the more exacting requirements connected with beet growing. This time it was lack of interest on the part of the growers that prevented the success of the industry.

The factory was opened for a third time in 1921, and this again proved to be a curly-top year, which caused a loss to both growers and manufacturers.

The curly-top, which follows the activities of the sugar-beet leafhopper, has been serious in only 3 years out of 16—1911, 1921, and

1923—and it is unfortunate that an opening of the factory took place in two of these seasons.

Muskmelon growing assumed the proportions of an agricultural industry in 1922, when 336 acres were planted, and the estimated production was 59,610 crates, or approximately 177 crates per acre. In 1923 the area was increased to 350 acres, with an estimated production of 34,913 crates, averaging about 100 crates to the acre. The decline in production is believed to have resulted from the late frost on June 13.

Table 1 presents a summary of the yields and crop values of all the important crops of the Newlands project for 1922 and 1923.

TABLE 1.—*Acreage, yields, and farm values of crops on the Newlands project in 1922 and 1923*

Crop	Area (acres)	Yield			Farm values		
		Unit	Total	Average per acre	Per unit of yield	Total	Average per acre
1922							
Alfalfa hay	29,943	Tons	95,850	3.20	$11.00	$1,054,350	$35.21
Alfalfa planted in 1922	1,163	do	131	.11	11.00	1,441	1.24
Hay (other than alfalfa)	114	do	118	1.04	11.00	1,298	11.39
Pasture, alfalfa						34,713	
Pasture, grass	6,401					12,989	2.03
Barley	437	Hundredweight	4,720	10.80	1.60	7,552	17.28
Oats	72	do	600	8.33	2.00	1,200	16.66
Wheat	2,410	do	30,200	12.53	2.00	60,400	25.06
Corn	160	do	2,200	13.75	2.00	4,400	27.50
Muskmelons	336	Crates	59,610	177.40	1.00	59,610	177.40
Potatoes	870	Tons	4,460	5.13	20.00	89,200	102.53
Garden	278					29,850	107.37
Miscellaneous crops	368					16,136	43.84
Irrigated without crops	2,570						
Duplications	159						
Net acreage irrigated	44,963						
Total value of crops						1,373,139	
Average income per acre							30.54
1923							
Alfalfa hay	28,210	Tons	84,541	3.0	10.00	845,410	30.00
Alfalfa planted in 1923	1,907	do	314	.16	10.00	3,140	1.65
Hay (other than alfalfa)	180	do	193	1.07	10.00	1,930	10.70
Pasture, alfalfa						25,609	
Pasture, wild grass	5,690					15,974	2.81
Barley	451	Hundredweight	7,920	17.57	1.60	12,672	28.11
Oats	70	do	900	12.86	1.83	1,647	23.53
Wheat	3,116	do	42,300	13.57	1.75	74,025	23.75
Corn	367	do				7,292	19.87
Muskmelons	350	Crates	34,913	99.75	1.04	36,222	103.49
Potatoes	659	Tons	3,230	4.90	30.00	96,900	147.00
Garden	229					17,840	77.90
Miscellaneous crops	242					14,132	58.39
Irrigated without crops	3,760						
Duplications	345						
Net acreage irrigated	44,886						
Total value of crops						1,152,793	
Average income per acre							25.68

In Table 2 is given the annual acreage and production for alfalfa, wheat, barley, oats, and potatoes for the 12-year period ended in 1923. The table indicates the progress or decline that has occurred in the production of these crops.

The greater part of the wild-grass pasture of the project is salt-grass land unsuitable for the production of cultivated crops. When

this area is subtracted from the total area irrigated we have left the total cultivated area, which was 38,562 acres in 1922 and 39,196 acres in 1923. Of this area alfalfa occupied 81 per cent in 1922 and 77 per cent in 1923. Ever since the beginning of the project alfalfa has been the crop of outstanding importance, both in the area occupied and in the value of the product.

TABLE 2.—*Acreage and production of leading crops on the Newlands project during the 12-year period from 1912 to 1923, inclusive*

Years	Alfalfa			Wheat			Barley			Potatoes		
	Acres	Yield (tons)		Acres	Yield (hundredweight)		Acres	Yield (hundredweight)		Acres	Yield (hundredweight)	
		Total	Per acre		Total	Per acre		Total	Per acre		Total	Per acre
1912	12,912	33,595	2.60	2,484	24,360	9.8	2,259	35,900	15.9	483	39,380	81.5
1913	13,960	45,132	3.23	1,590	18,163	11.4	880	20,754	11.0	416	17,873	43.0
1914	18,212	59,873	3.29	1,446	17,498	12.1	1,329	14,920	11.2	283	14,280	50.5
1915	18,273	53,496	2.93	2,582	32,439	12.6	1,733	23,801	13.7	196	15,080	76.9
1916	19,541	61,756	3.16	2,861	34,740	12.1	1,658	24,960	15.1	177	17,640	99.7
1917	20,360	72,769	3.57	2,532	25,940	10.2	1,116	12,880	11.5	322	33,860	105.2
1918	21,542	77,442	3.59	5,024	59,280	11.8	1,374	16,960	12.3	334	30,500	91.3
1919	24,188	92,850	3.84	5,423	49,960	9.2	519	5,220	10.1	152	14,620	96.2
1920	26,540	92,819	3.50	3,586	54,923	15.3	769	10,800	14.0	354	22,080	62.4
1921	28,287	95,561	3.38	2,443	40,120	16.4	732	9,380	12.8	484	55,840	115.4
1922	29,943	95,850	3.20	2,410	30,200	12.5	437	4,720	10.8	870	89.200	102.5
1923	28,210	84,541	3.00	3,116	42,300	13.6	451	7,920	17.6	659	64,600	98.0

Two factors have contributed to make alfalfa growing the leading agricultural industry of the project: (1) The net returns per acre were on the average as great as for any other easily marketable crop and (2) alfalfa was better than any other marketable crop to make productive the virgin land of the desert. For these reasons alfalfa has continued to be the chief money crop of the project up to the present time.

But new conditions are arising which are compelling farmers to adopt a more diversified type of farming. The revenue which before the war was adequate to bring a satisfactory farm income is no longer sufficient to leave a fair margin over the running expenses. The cost of production of alfalfa has nearly doubled over that of the prewar period, while the gross income remains substantially the same. This and alarm over the approach of the alfalfa weevil had the effect of causing a reduction in the alfalfa area during 1923 instead of the usual increase. The reduced profit from alfalfa hay has resulted in a somewhat wider diversification of crops, but the greatest effect has been to encourage the development of the dairy and poultry industries.

LIVESTOCK PRODUCTION

The numbers of the various kinds of livestock for the period from 1914 to 1923, inclusive, are shown in Table 3.

The number of stock cattle has continued to decline and the dairy cattle to increase since the close of the war period. The dairy-cattle population has increased over 250 per cent in the last four years. There was a slight decline in dairy cows during the war period, followed after the war by a very great increase.

TABLE 3.—*Number of livestock on farms on the Newlands project from 1914 to 1923, inclusive*

Year	Horses and mules	Cattle			Sheep	Hogs	Poultry		Bees (hives)
		Stock	Dairy	Total			Turkeys	Other	
1914	3,483	4,540	1,503	6,043	1,981	3,515	6,972	27,399	1,621
1915	3,780	5,957	2,433	8,390	4,710	4,836	12,000	22,912	2,500
1916	3,911	7,802	2,537	10,339	5,452	6,092	15,239	29,270	2,958
1917	3,467	7,581	2,044	9,625	3,346	3,170	9,042	24,056	1,933
1918	3,734	8,839	1,895	10,734	3,560	3,343	4,746	20,220	1,589
1919	3,532	6,778	1,850	8,628	3,347	3,048	3,442	25,932	2,821
1920	3,875	7,428	2,072	9,500	4,611	2,211	3,624	28,780	2,683
1921	4,038	6,732	3,597	10,329	7,707	1,793	4,834	28,582	2,983
1922	3,730	4,601	5,088	9,689	7,961	3,214	12,130	44,131	1,267
1923	3,822	4,266	6,738	11,004	7,286	2,975	27,254	45,240	2,302

The agricultural census shows that the number of dairy cows per unit area increases very decidedly as the farms are reduced in size. The number of livestock was tabulated after having divided the farms into classes according to size, as follows: Class A, 10 to 20 acres; B, 20 to 40 acres; C, 40 to 80 acres; D, 80 to 120 acres; E, 120 to 160 acres; F, 160 to 320 acres; G, 320 to 4,000 acres. These results are compiled in Table 4 for all classes of livestock.

The number of hogs on the project has continued to decline. Less than half as many hogs as dairy cows were reported on hand in 1923.

The poultry populations are rapidly increasing. There were nearly eight times as many turkeys grown in 1923 as in 1919. The climatic conditions seem to be ideal for the development of this industry. Like the dairy industry, the poultry industry is more intensively developed on small than on large farm units.

TABLE 4.—*Numbers of livestock per farm and per 100 acres on farms of various sizes on the Newlands project in 1923*

[The limiting areas of each class of farms, together with the average size per farm and the total area included in each class, are as follows: Class A—10 to 20 acres (average 16.5), 909 acres in all; class B—20 to 40 acres (average 31), 5,691 acres in all; class C—40 to 80 acres (average 59), 11,585 acres in all; class D—80 to 120 acres (average 101), 3,646 acres in all; class E—120 to 160 acres (average 141), 3,655 acres in all; class F—160 to 320 acres (average 216), 3,673 acres in all; class G—320 to 4,000 acres (average 804), 9,652 acres in all]

Kind of stock	Specification	Class A, 55 farms	Class B, 182 farms	Class C, 197 farms	Class D, 36 farms	Class E, 26 farms	Class F, 17 farms	Class G, 12 farms
Horses	Per farm	2.9	3.7	5.1	8.5	12.6	29.2	46.3
	Per 100 acres	17.5	11.8	8.7	8.4	9.0	13.5	5.8
Dairy cows	Per farm	3.2	5.4	7.5	13.4	8.8	18.7	38.0
	Per 100 acres	19.4	17.3	12.7	13.3	6.3	8.7	4.7
Heifers and bulls	Per farm	1.4	2.7	4.7	12.2	8.7	11.6	11.9
	Per 100 acres	9.1	8.6	8.0	12.1	6.2	5.4	1.5
Other cattle	Per farm	.8	2.6	5.5	4.9	19.1	38.2	110.0
	Per 100 acres	4.8	8.3	9.3	4.9	13.6	17.7	13.7
Sheep	Per farm	1.0	6.8	9.7	3.4	12.5	88.3	212.0
	Per 100 acres	6.1	21.7	16.5	3.4	8.9	41.0	26.4
Hogs	Per farm	1.5	4.0	5.3	6.5	4.3	17.2	30.6
	Per 100 acres	9.1	12.8	9.0	6.4	3.1	8.0	3.8
Turkeys	Per farm	20.6	40.4	49.2	44.2	31.5	50.0	78.5
	Per 100 acres	124.0	129.0	83.5	43.8	22.2	23.2	9.8
Other poultry	Per farm	79.3	60.5	85.8	99.2	68.2	82.2	162.0
	Per 100 acres	480.0	193.5	146.0	98.2	48.5	38.1	20.2
Bees (hives)	Per farm	2.8	2.0	3.4	3.8	.3	0	.8
	Per 100 acres	17.0	6.4	5.8	3.8	.2	0	.1

WEATHER CONDITIONS

Weather records are kept at the experiment farm in cooperation with the United States Weather Bureau and with the Biophysical Laboratory of the Bureau of Plant Industry. (Table 5.)

TABLE 5.—*Summary of climatological observations at the Newlands Experiment Farm for the 18-year period from 1906 to 1923, inclusive*

Year, etc.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
PRECIPITATION (INCHES)												
Average for 18 years [1]	0.70	0.45	0.39	0.53	0.50	0.36	0.16	0.32	0.37	0.32	0.27	0.57
For 1922	1.03	.97	.19	.43	.27	.16	.10	1.35	0	.07	.68	1.21
For 1923	.45	.11	.19	1.14	.53	.56	0	.13	.69	.27	.20	.56
EVAPORATION (INCHES)												
Average for 14 years [2]	1.13	1.80	4.11	6.18	8.21	9.72	10.73	9.53	6.43	3.83	1.97	0.93
For 1922	------	------	------	------	------	------	------	------	5.92	3.76	1.08	.79
For 1923	.83	------	3.64	4.99	6.99	6.49	8.46	6.83	4.79	2.88	1.37	------
DAILY WIND VELOCITY (MILES PER HOUR)												
Average for 15 years [3]	2.9	3.5	4.5	5.3	4.6	3.8	3.0	2.7	2.7	2.5	2.5	2.5
For 1922	1.6	3.4	4.0	4.6	3.5	2.9	2.1	2.2	1.1	1.9	1.4	1.8
For 1923	1.9	1.9	3.2	4.1	3.4	2.9	2.6	2.1	1.9	1.8	.9	1.4
ASPECT OF THE SKY (DAYS)												
Average for 18 years: [4]												
Clear	13.9	14.5	17.9	17.4	18.1	22.3	23.4	24.9	22.2	22.6	18.2	14.1
Partly cloudy	8.3	6.8	7.3	6.8	8.3	4.3	4.9	3.6	4.0	3.4	6.0	6.8
Cloudy	8.8	7.0	5.8	5.8	4.6	3.4	2.7	2.5	3.8	5.0	5.8	10.1
For 1922:												
Clear	16	12	13	18	22	22	22	23	28	25	18	5
Partly cloudy	1	5	7	6	5	6	5	3	2	1	5	6
Cloudy	14	11	11	6	4	2	4	5	0	5	7	20
For 1923:												
Clear	12	22	24	16	22	22	22	24	17	19	21	15
Partly cloudy	2	1	0	4	4	0	5	2	3	4	5	6
Cloudy	17	5	7	10	5	8	4	5	10	8	4	10
TEMPERATURE (° F.)												
Average for 18 years: [4]												
Absolute maximum	58.6	63.9	73.9	80.7	87.8	96	100.4	98.8	92.1	82.8	71.9	61.4
Daily maximum	43.3	49.4	58.9	66.1	72.9	83.4	93.2	91.3	80.7	67.9	55.8	44.6
Absolute minimum	0	6	16	20	28	36	44	41	30	20	10	3.6
Daily minimum	17.6	22.5	27.6	34.1	40.5	47.2	54.1	51.6	42.9	32.8	23.9	19.1
Monthly mean	30.4	35.8	43.2	50.1	56.7	65.3	73.6	71.3	61.7	50.4	40.3	30.7
18-year record: [4]												
Highest recorded	70	78	79	89	102	102	105	103	96	89	81	72
Lowest recorded	−25	−12	9	13	21	31	38	36	26	13	−1	−4
For the year 1922:												
Absolute maximum	46	59	70	76	88	102	105	98	95	87	67	60
Mean maximum	33.4	43.4	55.2	61.1	75.5	89.3	95.7	89.9	86.6	70.7	51.3	45
Absolute minimum	−11	−1	11	17	23	41	43	39	34	15	13	6
Mean minimum	12.9	21	26.4	28.7	38.8	49.6	54.8	50.5	44.8	33.8	20.3	26.6
Mean	23.1	32.2	40.8	44.9	57.2	69.5	75.3	70	65.7	52.3	35.8	35.8
For the year 1923:												
Absolute maximum	67	62	76	79	86	97	101	95	96	79	68	61
Mean maximum	47.5	45.6	59.7	65	75.1	77.7	92.8	88.9	80.8	65.8	59	44.2
Absolute minimum	0	−4	13	20	31	32	41	41	32	23	12	−2
Mean minimum	20.9	15.9	24.8	33	41.9	43	54.4	50.5	46	32.4	24.1	14
Mean	34.2	30.8	42.2	49	58.5	60.4	73.8	69.7	63.4	49.1	41.5	29.1

[1] The records for January, February, and March cover only 17 years.
[2] February records are for 10 years; January records are for 11 years. Records for March and December are for 13 years; the other months have records for 14 years.
[3] The records for January, February, March, and November cover only 13 years; those for April, October, and December are for 14 years.
[4] The records for March and October cover only 17 years.

TABLE 5.—*Summary of climatological observations at the Newlands Experiment Farm for the 18-year period from 1906 to 1923, inclusive*—Continued

KILLING FROSTS

Year	Last in spring	First in autumn	Frost-free period (days)	Year	Last in spring	First in autumn	Frost-free period (days)
1906	May 31	Oct. 4	125	1916	June 1	Sept. 10	100
1907	May 14	Sept. 19	127	1917	May 21	Sept. 25	126
1908	May 30	Sept. 25	117	1918	May 29	Oct. 7	130
1909	May 24	Sept. 22	120	1919	May 6	Sept. 22	138
1910	May 16	Sept. 23	129	1920	May 3	Sept. 25	144
1911	May 27	Sept. 18	113	1921	May 29	Sept. 13	106
1912	May 22	Sept. 25	125	1922	May 28	Oct. 4	128
1913	May 13	Sept. 23	132	1923	June 13	Sept. 24	102
1914	Apr. 24	Sept. 9	137				
1915	May 20	Sept. 14	116	Average	May 21	Sept. 22	123

In 1923 the last killing frost occurred June 13, with a temperature of 32° F. Considerable damage was done to muskmelons, tomatoes, and other tender garden products in many parts of the project. On the bench lands the damage was less severe than on the low lands. On the experiment farm about 10 per cent of the tomato vines were completely killed and a large portion of the remainder badly injured. This frost was probably the cause of the relatively low yields of muskmelons in 1923. This is the latest spring frost during the 18 years that the records have been kept. The first killing frost in the fall occurred on September 24, which is about the average date.

The coldest temperature recorded during the year was −4° F. in February. The mean temperature for the year was nearly normal.

The total precipitation during the year was 4.83 inches, which is very close to normal, the average for 18 years being 4.94 inches.

The wind velocity appeared to be lower than normal during every month of the year. This may be owing to the fact that the anemometer was changed in January from its former location on a sand dune about 10 feet high to a lower position nearer the buildings. For the same reason the average monthly evaporation appears to have been lowered in 1923.

ALFALFA PRODUCTION

From the beginning of the project to the present time alfalfa has been the most important money crop of this region. The use of alfalfa as a cash crop will probably no longer be feasible, because of the approach of the alfalfa weevil, which has already arrived at the western edge of the project and will undoubtedly soon spread to the other portions. This condition has already had the effect of producing a change in the character of the agriculture by promoting diversification of crops and hastening the development of the dairy industry. With proper care there is no necessity for the farmers of the project to suffer any material loss by inability to dispose of alfalfa to outside markets.

Alfalfa has occupied about 80 per cent of the cultivated crop area of the project. By reducing this to 70 or 75 per cent it will be possible to feed all the hay produced on the project to local livestock. The reduced alfalfa area may be replaced by grain, potatoes, muskmelons, and possibly sugar beets if arrangements are again made for

the operation of the factory. The further diversification of crops, together with the promotion of the dairy industry, may result in a more profitable agriculture than the project has heretofore experienced.

Alfalfa is usually the best crop to sow on the raw land immediately after removing the native vegetation. It is instrumental in improving the soil so as to make it better adapted to the production of other crops.

It is seeded at the rate of 10 to 15 pounds per acre, some growers preferring to sow as much as 20 pounds when conditions are not suitable for good germination of the seed. Difficulty in obtaining stands may arise from several causes. The soil may contain too much alkali, or it may crust so hard that the young plants are unable to emerge, or the new crop may be destroyed by blowing sands.

To obtain a stand on land which forms a hard surface crust on drying after irrigating, it is often necessary to give frequent irrigations even when there is ample moisture immediately below the surface. Breaking the crust with a roller or harrow sometimes helps, but frequently the land dries too unevenly to make treatment of this kind practicable. With this type of soil only a short time elapses between the moment when the soil is too wet to work, on the one hand, and too hard to break, on the other.

When alfalfa is planted on loose sandy soil in early spring it is not at all unusual to have a part of the stand killed by the blowing sand. This may be in large part avoided by first seeding grain on the land and drilling in the alfalfa when the grain is a few inches high. Another and perhaps better method is to sow the alfalfa in the stubble in August after the grain has been harvested.

The question as to the best variety of alfalfa to grow frequently arises. Tests of alfalfa were conducted in 1912, 1913, and 1914 at the experiment farm with 11 varieties supplied by the Department of Agriculture. The results indicated that the only variety equal to the common western-grown alfalfa was the Grimm. The price of seed of this latter variety is very high, and its advantages over the common alfalfa are probably not sufficient to justify the additional expense for seed.

VARIETAL AND CULTURAL TESTS OF FIELD CROPS

BARLEY

The average yield of barley on the project for a period of 12 years has been 12.9 hundredweight (26.9 bushels) per acre. This average includes yields from all types of soils, so that the yields of the best farm lands would average considerably higher than this. Yields of more than 1 ton to the acre are not uncommon. Barley is relatively alkali resistant and is frequently used as a first crop on salty soils.

Six varieties of barley have been tested in comparison with the kind commonly grown on the project. The results indicate that the common Coast barley and the variety locally grown are more productive than any of the others in this test. Table 6 gives the yields obtained for a period of five years.

The average yield of the Coast variety for a period of five years was 16.6 hundredweight (34.5 bushels). As these tests were made on private farms in various parts of the project, the average, 16.6

hundredweight, may be taken as typical of the productive capacity of the better soils of the project. Yields exceeding 20 hundredweight per acre are not uncommon on the best soils.

TABLE 6.—*Varietal tests of barley on the Newlands Experiment Farm*

Variety	Length of test (years)	Average yield per acre		Variety	Length of test (years)	Average yield per acre	
		Pounds	Bushels			Pounds	Bushels
Coast	5	1,657	34.5	Svanhals	5	1,232	25.7
[Local]	4	1,474	30.7	Chevalier	5	1,227	25.6
Trebi	3	1,323	27.6	Nepal (Hull-less)	5	1,010	21.0
Hannchen	5	1,298	27.0				

WHEAT VARIETIES

The average yield of wheat on the entire project for a period of 12 years has been 12.5 hundredweight (20.8 bushels) per acre. This includes yields on poor as well as on good fields of the project, so the average yield on good farm land would be somewhat higher than the above figures.

Tests to determine the variety best adapted to the project were conducted on the experiment farm for a period of five years. It will be noted from the results given in Table 7 that the Little Club variety has been much more productive than any other. Little Club is not a desirable milling wheat, but if the crop is to be utilized for feed there is probably no better variety to grow.

TABLE 7.—*Varietal tests of wheat on the Newlands Experiment Farm for a five-year period*

Variety	Average yield per acre		Variety	Average yield per acre	
	Pounds	Bushels		Pounds	Bushels
Little Club	2,468	41.1	Bluestem	2,095	34.9
Rieti	2,226	37.1	Marquis	2,008	33.5
Sonora	2,129	35.5	Defiance	1,992	33.2
Dicklow	2,027	33.8			

Early Baart has been grown for two years and has been found to be a very good variety for milling purposes.

No experimental trials have been made with any varieties of winter wheat, but a small acreage of Turkey Red is raised each year on a few farms of the project. It is said to produce at least as much as the spring wheats.

OATS

Oats is not an important crop on the Newlands project, less than 100 acres having been planted annually on the entire project during the past seven years. The average yield per acre of oats as reported in the annual census of the Bureau of Reclamation for the period from 1912 to 1923, inclusive, has been 14 hundredweight per acre (43.8 bushels).

RYE

Rye has been grown to a very limited extent on the Newlands project. No data are available as to the yield of grain per acre. Rye may be planted the latter part of August or early in September for fall or spring pasture. Three crops may be obtained from the land in two years by planting rye in the stubble of wheat or barley after the crop is removed. The rye provides some fall pasture and excellent spring pasture until the middle of May. The last of May it may be turned under and the land planted to Sudan grass or millet.

CORN

Owing to the variability of the growing seasons it has been very difficult to obtain reliable results from variety tests of corn. In the short seasons the early-maturing varieties are most desirable, but when the project is favored with frost-free periods of 120 days or more the medium or late varieties are most productive. Until something better is found, Minnesota No. 13 can be recommended as a fairly productive early yellow dent. Australian white flint has matured seed in the most unfavorable seasons, and the yield per acre averages very high, but as flint corn is not so desirable as dent corn most farmers prefer to grow a dent variety.

FODDER AND SILAGE CORN

Excellent yields of fodder or silage corn are obtained each year, as it is not necessary or desirable that the grain be fully matured before cutting for this purpose.

The acreage of corn planted for fodder and silage is increasing on the project along with the increase in dairying. A difference of opinion exists among dairymen as to the most profitable type to grow—a medium-sized early variety or one that is rank growing and late maturing. The medium-early varieties do not produce so much silage, but the silage is usually of a better quality than that obtained from the rank-growing sorts. Reid Yellow Dent has been found to be very good for silage production.

POTATOES

Certain sections of the project, particularly the river bottom lands and the bench lands, are well adapted to the production of potatoes. The average annual production per acre from 1912 to 1923, inclusive, was 8,775 pounds (146 bushels). The average area planted on the project during the same period was 394 acres a year. The Burbank and Netted Gem (Netted Burbank) are the two varieties most commonly grown. The Burbank appears to be the highest yielding variety, but it has the disadvantage of producing more second growth than any of the others when grown under unfavorable moisture conditions.

Experiments conducted for a period of years indicate that the selection of medium-sized seed from the bin results in greater yields than when small tubers from the same bin are planted for seed. It is not therefore advisable to follow the common practice of planting culls.

Time-of-planting tests conducted for three years indicate that it is safe to plant potatoes from April 20 to the middle of May, but plantings made after the latter date are likely to be less productive.

Tests have been made comparing whole and cut seed, the results of which have been published in previous reports from this station. In nearly every case the planting of whole seed has resulted in increased yields. When very large tubers are planted whole the quantity of seed required is so great as frequently to offset the increase in production. In planting whole potatoes selected tubers of medium size should be used, or, better still, seed specially grown for this purpose by late planting. The use of small potatoes or culls from the commercial field causes a decided reduction in yield, but small tubers from special seed plats where all the potatoes produced are small may be used without fear of injury to the crop. In the former case the seed is drawn from the weakest hills, while in the latter the seed used is the average of the field. Because of the wide prevalence of potato diseases eternal vigilance is necessary to prevent degeneration of the stock.

ONIONS

The onion industry has not been developed commercially within the project to any extent. A few attempts at commercial production have been made, but the uncertainty of markets and scarcity of labor have been factors preventing development. The soil along the river bottoms and in the Island district has proved to be well adapted to onions, the yields ranging from 5 to 20 tons per acre. Onion growing may be looked upon as a potential industry for the project when economic conditions become favorable. Fertilizer tests with onions in 1914 indicated that yields could be increased from 20 to 50 per cent by the application of a complete fertilizer at the time of seeding.

SORGHUM

The grain sorghums, feterita, milo, and kafir, have been tried at the experiment farm for several seasons. Frequently they do not mature seed, and for this reason a general planting of these crops is not recommended in this locality. Broomcorn is promising, and the growing of this crop for the manufacture of brooms is a possibility of the future. Early Amber sorgo may be grown as a forage crop and for the manufacture of sirup. When planted on good soil it produces from 3 to 6 tons of air-dry fodder per acre. If grown for sirup production it is estimated that from 75 to 100 gallons per acre may be obtained. It is recommended that the manufacture of sorgo sirup as an industry be encouraged.

TOMATOES

The growing season for tomatoes on the Newlands project is rather short, so the earliest maturing varieties should be selected. The vines are nearly always cut down by frost the latter part of September when the later maturing varieties are at the peak of production. For small gardens the season can be materially lengthened and the yield usually more than doubled by protecting the vines with a thick covering of wheat or barley straw. This may be piled in windrows through the patch, and the vines can then be covered in a few minutes the first night that frost threatens.

If grown commercially, rather fluctuating yields would be obtained, on account of the diversity in the length of the frost-free period. Many varieties have been tested at the experiment farm, and the

results indicate that Earliana is the highest producer. The lowest yield obtained was 3.5 tons per acre in 1915 and the highest 18.5 tons in 1922, the average for five consecutive years being 7.8 tons.

In 1923 an experiment was conducted with 14 varieties, as shown in Table 8. By mistake Earliana was omitted from this test. The plants were transferred to the field on May 25. They were injured by frost on June 13, when slightly more than 9 per cent were killed. This is the latest killing frost so far recorded. Many of the plants, though not killed, were seriously injured, which may account for the rather high losses that followed from the western blight. The average loss from this cause was 29 per cent in 1923, 9.6 per cent in 1922, 15.5 per cent in 1921, and 55 per cent in 1919. It will be noted that the percentage of tomato blight from year to year is exceedingly variable.

TABLE 8.—*Varietal test of tomatoes on the Newlands Experiment Farm in 1923*

Variety	Number of plants	Date of first picking	Yield (pounds)		Yield per acre (tons)	
			Total	Per plant	Full stand	Blight loss deducted
Earlibell	25	Aug. 25	258	10.3	14.1	9.3
John Baer	25	do	244	9.8	13.3	9.2
New Globe	23	Aug. 31	208	9.0	12.3	7.4
Bonny Best	26	do	218	8.4	11.4	8.2
Ponderosa	26	do	200	7.7	10.5	6.8
June Pink	27	Sept. 1	201	7.4	10.2	7.2
Norduke	26	Sept. 11	163	6.3	8.5	6.0
Marvel	22	Aug. 28	135	6.1	8.4	4.9
Harrison Prolific	32	Aug. 23	163	5.1	6.9	5.5
Norton	26	Aug. 25	122	4.7	6.4	4.0
Golden Queen	25	Sept. 4	83	3.3	4.5	3.3
Dwarf Champion	32	Aug. 29	100	3.1	4.3	3.5
Perfection	38	Aug. 25	91	2.3	4.4	3.3
Yellow Pear	29	Aug. 28	60	2.1	2.8	2.6

Yields have been obtained with a few tomato varieties for a series of five to seven years, and these are presented in Table 9. Of those tried Earliana and Perfection are the two highest yielding varieties. Although Earliana possesses the desirable qualities of earliness and productivity, the tomatoes are not so smooth as Perfection and many other varieties. Earlibell, John Baer, and June Pink are very desirable varieties that have been on trial but a short time. The yield of the Dwarf Champion could probably be considerably increased by closer planting than the standard distance of 4 by 4 feet that has been employed in all tests.

TABLE 9.—*Yields of tomato varieties on the Newlands Experiment Farm in stated years*

Variety	Number of years grown	Yields per acre (tons)							
		1914	1915	1916	1917	1921	1922	1923	Average
Earliana	5		3.5	5.7	3.7	7.6	18.5		7.8
Perfection	6	6.3	5.4	3.9	4.4		19.5	4.4	7.3
Stone	6	4.5	1.9	.1	1.6	3.1	12.9		4.0
Ponderosa	5	6.0	1.0	0	1.1			10.5	3.7
Globe	5	5.0	1.9	.4	1.0		10.1		3.7
Golden Queen	5	3.7	1.2	0			7.5	4.5	3.4
Dwarf Champion	7	3.7	1.6	.3	1.8	2.2	6.5	4.3	2.9

MUSKMELONS

As a commercial enterprise of the Newlands project muskmelon growing began in 1921. Previous to that time small acreages had been grown to supply the local market, and one grower had built up a small shipping trade with near-by Nevada and California towns, but no car-lot shipments were made prior to 1921. During the spring of 1922 a campaign was conducted to stimulate interest in the establishment of this industry, and as a result several hundred acres were contracted for by a wholesale dealer, who agreed to pay farmers $1 a crate for all acceptable melons. Railroad strikes, combined with a slump in the melon market, prevented the profitable disposal of the shipments to eastern markets. Some of the growers received no returns whatever for their melons, while others were given only part of the contract price. The acre yield of the melons was good and the quality excellent, so that the failure to realize a profit was attributable to market conditions and was not indicative of the unsuitability of the industry to the project.

In 1923 three commission firms made contracts with farmers for the delivery of melons from about 350 acres, and an average yield of nearly 100 crates per acre was obtained. The late frost occurring on June 13 killed many vines and materially reduced the yield. Notwithstanding this setback the crop was generally profitable, and the indications are favorable that the industry will become established.

The variety selected for the project is sold under the trade name "Hearts of Gold." It is a melon with salmon-pink flesh and a very small seed cavity. The shape is somewhat oblong, and the skin is thin and well netted. It is a first-class shipping melon, pleasing in appearance, and of excellent flavor.

The general practice in planting is to make the hills 6 feet apart each way. The fields are marked in 6-foot squares and furrows made in one direction for irrigation. Frequently the water is run in the furrows before planting, so as to establish a water line along which the seeds are planted. In sandy soils, through which the water seeps rapidly, it is not necessary to establish this water line, but it is considered the best practice to follow on the heavier soils, which are more difficult to irrigate.

The average frost-free period on the Newlands project is 123 days, from May 21 to September 22. The cool nights and rather short growing period make it advisable to plant the seed as early in the spring as can be done without loss of the plants by the late spring frosts. Two methods to insure against loss are practiced. One is to plant the seed during early May and protect the hills with paraffined paper caps that are sold on the market for this purpose. The other method is to make two plantings, about 10 days apart, in the same hills, the first on May 5 and the second about May 15, without waiting to see whether the first planting will be injured by frost. By this method, if the plants from the first seeding are wholly or partially destroyed by frost they will be replaced from the later seeding; if the first stand is not lost the later plants may be removed during the first hoeing. In case of light frosts it is sometimes possible to avoid serious loss of plants by night irrigation during the period of low temperature.

While the plants are growing it is essential, as with all cultivated crops, to keep the ground loose and free from weeds. The first

melons to form, or the "crown set," are the choicest, and if seed is to be saved the supply should be obtained from these.

The first melons are usually ready to pick about August 20, and from that time until the first killing frost the vines should be gone over at least once a day and all mature melons picked. Muskmelons when fully ripe will easily slip from the stem; but the commission men like them picked a little previous to full ripeness, or when the stem has commenced to slip. When overripe the shipping quality is impaired, so that the melons will not stand shipment to distant points. On the other hand, melons that have been picked too green never attain the delicious flavor of the naturally ripened product; so that it is essential if the good will of the purchasers is desired to permit the melons to ripen on the vine as much as possible without injuring their shipping qualities. For this reason melons billed to near-by points should be picked riper than those intended for the eastern cities, which may be two weeks en route.

VARIETAL TESTS OF FRUITS

Many inquiries come to the station each year in regard to the varieties of fruit trees best adapted to this region. The varieties mentioned in the lists below are known to be successfully grown on the Newlands project. Other desirable varieties may be added from time to time as their worthiness is proved. No attempt is made to give a complete list of the varieties grown on the project, but only those that appear to possess outstanding qualities of merit. The facts have been obtained by interviewing several of the fruit growers of the project and by examination of the records of the experiment farm. Those varieties printed in **boldface type** are recommended for first choice.

APPLES

Summer varieties.—**Yellow Transparent**, **Red June**, Red Astrachan, Maiden Blush, Lowland Raspberry (*Livland Raspberry*).

Fall and early winter varieties.—**Wagener**, **Wealthy**, McIntosh.

Winter varieties.—**Rome Beauty**, **Black Ben**, **Gano**, **Jonathan**, **King David**, Delicious, Grimes Golden, Paragon, Stayman Winesap, Winter Banana.

APRICOTS

Apricots are not recommended for extensive planting, as the blossoms are frequently killed by late spring frosts.

CHERRIES

Some of the common sour varieties of cherries fruit nearly every season, but the sweet cherries are less reliable bearers. Of the sour varieties Early Richmond, Montmorency, and May Duke are recommended.

PEARS

Information in regard to pears is not so complete as with apples, but a few varieties have been found to bear regularly. Those recommended are **Bartlett**, Duchess d'Angouleme, Flemish Beauty, Seckel, Winter Nelis, Barry, and Easter Beurre.

PEACHES

Although peaches are not reliable bearers in this climate, there are seasons when they bear full crops and produce fruit of excellent quality. A full crop is produced only about two years out of five; but some fruit is produced nearly every year, so that it is advisable that every farm orchard contain a few peach trees. The varieties recommended are **Late Crawford**, **Illinois**, **Elberta**, Muir, and Phillips Cling.

GRAPES

Grapes are grown successfully on the bench lands, the river bottoms, and on the heavier soils of the Island and Stillwater districts. They do not grow satisfactorily on some of the reclaimed desert lands of the project. The varieties recommended are **Concord**, **Diamond**, **Brighton**, Worden, and Agawam.

PLUMS

Plums are very regular bearers, and a fair crop may be expected from some varieties almost every year. Those recommended for general planting are **Omaha**, **Damson**, **Bradshaw**, Compass Cherry, and Sapa. The last two varieties are hybrids between the sand cherry and some commercial variety. They are listed here because of their persistent bearing. They do not grow into large trees, but are bushlike in habit. Although the quality is not of the best, it is worth while to have a few of these trees in the orchard.

EXPERIMENTS WITH LIVESTOCK

HOG-FEEDING EXPERIMENTS

The object of these experiments was to determine the relative feeding value of alfalfa pasture and alfalfa hay and of buttermilk when fed to pigs in conjunction with the barley ration.

TABLE 10.—*Comparison of alfalfa pasture with hay and of grain as a supplement with and without buttermilk for growing pigs in 1923*

Items of comparison	Pigs on pasture		Hay fed pigs	
	Lot I, barley	Lot II, barley and buttermilk	Lot III, barley	Lot IV, barley and buttermilk
Length of test ... days	105	105	119	119
Initial weight ... pounds	204	199	205	203
Final weight ... do	539	516	483	498
Gain, total ... do	335	317	278	295
Gain, daily, per head ... do	.64	.60	.47	.50
Gain, daily ... per cent	.93	.91	.72	.76
Barley fed ... pounds	723	342	751	388
Buttermilk fed ... gallons	.....	206	.....	235
Value of barley at 2 cents	$14.46	$6.84	$15.02	$7.76
Value of buttermilk at 1 cent	.....	2.06	.....	2.35
Value of alfalfa	4.50	4.50	9.15	9.15
Total cost	18.96	13.40	24.17	19.26
Cost per 100 pounds of gain	5.66	4.23	8.68	6.53

Twenty pigs were divided into four lots, each having approximately the same initial weight, and these lots were rationed as follows:

Lot I.—Alfalfa pasture+2 per cent barley.
II.—Alfalfa pasture+1 per cent barley+5 per cent buttermilk.
III.—Alfalfa hay+2 per cent barley.
IV.—Alfalfa hay+1 per cent barley+5 per cent buttermilk.

By a 2 per cent barley ration is meant that the pigs were fed 2 pounds of barley a day for each 100 pounds of live weight.

The pigs at the beginning of the experiments weighed approximately 40 pounds each. Barley was charged at 2 cents per pound, buttermilk at 1 cent per gallon, and hay at $8 a ton. The results obtained are shown in Table 10.

FIG. 1.—Hogs of Lot I in the alfalfa pasturing experiment, Newlands Experiment Farm

It will be noted that the pigs on alfalfa pasture made more rapid and cheaper gains than those on alfalfa hay. (Fig. 1.) The increase in the cost of feeding alfalfa hay was apparently due in part to the waste of the coarse stems, which the pigs refused to eat. Probably a more economical way to feed alfalfa hay would be in the form of meal or finely chopped hay.

It was found that the 206 gallons of buttermilk fed to the pasture lot reduced the cost of the barley $7.62, which made the buttermilk worth 3.7 cents per gallon. To the pigs on the hay lot, 235 gallons of buttermilk reduced the cost $7.26, making the buttermilk worth 3.1 cents per gallon. The average value of the buttermilk for the two lots of pigs was therefore 3.4 cents a gallon, or approximately 41 cents per hundred pounds.

A similar experiment was conducted in 1922, but in that case the pigs receiving buttermilk were given no barley. The results then

obtained indicated that buttermilk is worth 30 cents per hundredweight when barley costs $2. It has been shown by experiments at other stations that skim milk and buttermilk are practically identical in feeding value and that either when supplemented with a little grain is more efficient than when fed alone. The digestive apparatus of a pig is not ample enough to accommodate the large quantity of buttermilk required when no concentrates are given. It is therefore advisable to feed a little grain along with it.

Many farmers have expressed the opinion that a valuation of 25 cents per hundredweight for skim milk is too high when calculating the income from dairy herds; but, assuming buttermilk and skim milk to be of equivalent value, our experiments corroborate those of many other stations in placing a still higher value on skim milk. The actual value is, of course, determined by the cost of the barley.

When barley is worth—

$1 per hundredweight skim milk is worth 20 cents per hundredweight.
$1.50 per hundredweight skim milk is worth 30 cents per hundredweight.
$1.75 per hundredweight skim milk is worth 35 cents per hundredweight.
$2 per hundredweight skim milk is worth 40 cents per hundredweight.

If the skim milk is fed without grain its value would be reduced 25 per cent from the above figures. In the experiments in 1923, 5 pounds of buttermilk were found to be equal in feeding value and took the place of 1 pound of barley. A dairyman would be very conservative who calculated 1 gallon of skim milk as equal to 1 pound of barley.

Hogs on dairy farms will be profitable if properly fed. Feeding is not at all difficult. A suitable feed consists of—

(1) Alfalfa pasture, about 20 pigs per acre.
(2) Rolled barley, 1 per cent ration, that is, 1 pound of rolled barley a day for each 100 pounds of live weight. The weight of the pigs can be estimated from time to time as they grow.
(3) From one-half to 1 gallon of skim milk or buttermilk a day for each 100 pounds of live weight.

EXPERIMENTS WITH PIGS ON SELF-FEEDERS

When the pigs in the feeding experiment had reached an average weight of 100 pounds they were placed on self-feeders where they could help themselves to all the barley they desired, but the buttermilk was omitted from the ration. After they were put on self-feeders no hay was eaten by the alfalfa-hay lots and very little alfalfa by those in the pasture lots, so that in the figures shown in Table 11 no charge is made for alfalfa. During the fattening period the four lots of pigs received the same ration; but it was found that the character of the ration during the growing period affected the rapidity of gains on the self-feeders, so it will be necessary to keep clearly in mind the rations received by each lot, as stated on page 16.

Table 11 gives the results obtained on self-feeders. It should be kept in mind that the pigs of each lot had access to the same ration and that the difference in cost of gains is apparently due to the after-effect of the feed previously given.

The pigs which had received a buttermilk ration during the growing period made very much cheaper gains on the self-feeders after the buttermilk had been discontinued; in other words, there was a beneficial after effect from the buttermilk ration.

TABLE 11.—*Results of feeding pigs by self-feeder without pasture or buttermilk*

Items of comparison	Lot I	Lot II	Lot III	Lot IV
Length of test ... days	42	42	42	42
Initial weight ... pounds	539	516	483	498
Final weight ... do	937	987	883	970
Gain, total ... do	398	471	400	472
Daily gain per head ... do	1.89	2.24	1.90	2.24
Barley fed ... do	1,624	1,619	1,635	1,806
Barley fed per 100 pounds of gain	408	344	409	383
Value of barley at 2 cents	$32.48	$32.38	$32.70	$36.12
Cost per 100 pounds of gain	8.16	6.88	8.18	7.66

The experiment on self-feeders indicates that when barley costs $2 a hundredweight there would be little or no profit in fattening when hogs sell at $8 a hundred. However, since Lots II and IV made gains somewhat cheaper than Lots I and III, there is a possibility that still greater economy would be obtained if the buttermilk ration had been continued during the fattening period.

Our results are in harmony with the suggestions of L. E. Cline, of the Office of Demonstrations on Reclamation Projects, that the greatest profits from hogs are to be made by growing feeders and selling them at about 100 pounds. Up to this weight very profitable gains can be made; during the fattening period the profits are comparatively small, and, in fact, may easily result in a loss when the cost of grain is high. Lots I and III, which sold at 8 cents a pound, did not pay for the feed consumed while on self-feeders.

CROPS FOR PASTURE

Interest in permanent grass pastures has been increasing on the Newlands project with the growth of the dairy industry. It is believed by many that grass pastures are sufficiently advantageous to justify their establishment on many, if not on all, dairy farms. Experiments indicate that an acre of grass pasture will provide as much feed as an acre of alfalfa grown for hay. The pasture economizes labor after the first year by saving the expense of putting up the hay crop, and it offers the cows an agreeable change in feed, thus promoting their health. Pastures have the disadvantage of requiring more frequent irrigations than alfalfa.

The seed mixture recommended for the Newlands project, which has been in use at the experiment farm for a number of years, is as follows: White clover, 1 pound; alsike clover, 1 pound; *Bromus inermis*, 5 pounds; orchard grass, 4 pounds; tall oatgrass, 5 pounds; English ryegrass, 3 pounds; Kentucky bluegrass, 2 pounds; meadow fescue, 2 pounds; and redtop, 2 pounds. This mixture is sufficient for an acre.

It is believed that a pasture of mixed grasses is more productive than a pasture of any single grass. In walking over a field of mixed grasses it is always noticeable that in some places one variety and in others another predominates, according to the character of the soil or to the inequalities of irrigation. Some kinds prefer the drier and others the moister portions of the field.

The poorer soils of the farm should not be selected for a permanent pasture of mixed grasses. The possible returns justify the use of

the most productive soil for pastures: the use of poor soil is likely to prove unprofitable and unsatisfactory because of poor stands, low yields, and weeds.

Sweetclover makes an excellent pasture for dairy stock but is not satisfactory for hogs. It may be used on the poorer lands of the farm that do not produce satisfactory grain or alfalfa crops. Sweetclover is especially adapted to poor lands, for the reason that it improves the soil while providing excellent pasture. Seeding may be done either in spring or fall. The usual rate of seeding is 15 pounds per acre.

Rye is a crop that could be profitably utilized for pasture in the early spring to a much greater extent than is now the practice. It may be seeded in wheat or barley stubble in September, pastured in spring until the middle of May, and then plowed under and the land used for Sudan grass, millet, or corn, thus getting three crops in

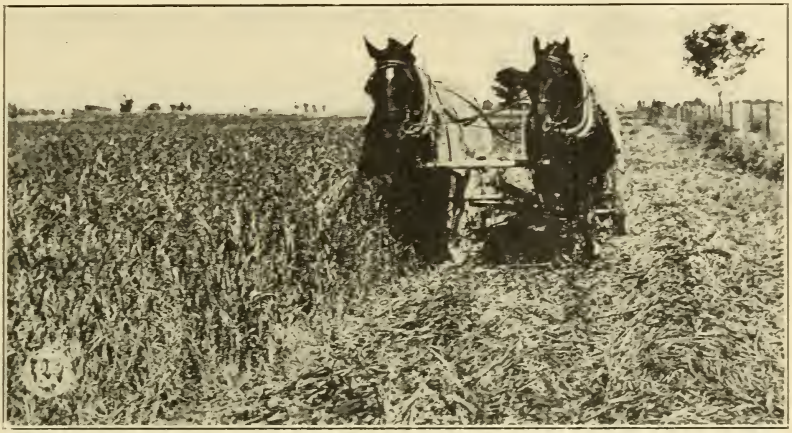

FIG. 2.—Hog millet following rye pasture on the Newlands Experiment Farm. The millet was seeded June 9 and harvested August 20, 1923

two years. (Fig. 2.) Rye pasture does not produce a large milk flow from dairy cows, but it is excellent for dry stock. On the experiment farm rye produced the equivalent of pasture for one cow for 100 days for each acre. (Fig. 3.) This may be considered equal to 1.75 tons of alfalfa hay.

LIVESTOCK INDUSTRIES [2]

The abundance of alfalfa in the Newlands project has naturally led to the establishment of livestock industries. As might be expected, a number of these industries have been tried, and the ones making the best use of alfalfa hay have shown the greatest development. Since alfalfa has been the principal crop on the project and probably always will be, because of its natural adaptation, the livestock industries have come in to provide a market for alfalfa hay.

The swine, sheep, dairy, and poultry industries have all been tried, and with the exception of the swine industry very definite progress has been made.

[2] Prepared by L. E. Cline.

SWINE

The raising of swine has gradually diminished during the past seven years, as other livestock industries have increased. On farms where skim milk is available hogs may be kept to good advantage. The lack of abundant and cheap supplies of grain probably accounts for the small number of hogs produced on the project.

The marketing of hogs from the Newlands project has been carried on almost entirely through cooperative effort. By this means all the marketable hogs on the project are pooled from time to time and consigned to the Reno or San Francisco markets, where they are sold as individual consignments. The local prices received are $1 per 100 pounds under San Francisco quotations and 50 cents per hundred under Reno quotations. It is to be expected that swine raising will continue to have some place in the farming scheme of the project; but it seems now that the industry will be largely a side line to dairying, in order that there may be proper utilization of skim milk. Practically all hogs raised on the project at the present time are kept for this purpose.

FIG. 3.—Cows on rye pasture on the Newlands Experiment Farm. A pasture value equivalent to one cow for 100 days was obtained

SHEEP

Sheep on the Newlands project have never attracted much attention. The methods of farming have not been adapted to the raising of sheep. The universal growing of alfalfa precludes the use of pastures, since the pasturing of alfalfa by ruminants is hazardous, on account of the danger of loss from bloat. The 1923 census of the Bureau of Reclamation shows that 7,286 sheep were kept on the project in bands varying from a few hundred down to small farm flocks of 25 to 50. The reports from farmers having sheep on their ranches indicate that very good returns are possible where small bands are raised. The tendency is to maintain small flocks, because they must be closely corralled throughout most of the year. With the greater interest in mixed-grass pastures manifested during the past two years sheep production is expected to increase, as this method of feeding is well adapted to the handling of sheep.

DAIRYING

The dairy industry on the Newlands project has become of first importance. People on the project who have been here longest and have the largest financial interests have come to regard dairying as absolutely essential to proper agricultural development. This idea did not prevail until the past year or two. The reliable and steady cash income which dairying has yielded during the stringent times through which farming has passed has served to stimulate confidence in the industry, especially among the owners of the smaller ranches. A number of the large farms on which beef cattle were formerly raised and fattened for market have been changed to dairy farms during the past two years.

No other livestock industry seems to fit so well into the cropping system of the project. The assurance of abundant alfalfa crops relieves the dairyman of any anxiety as to his feed supply. Up to the present time dairying has been carried on with alfalfa as a single ration with very gratifying results. Climatic conditions are also favorable. The dry climate and the comparative freedom from extremes of temperature add greatly to the satisfaction of handling dairy cattle. Elaborate housing facilities are unnecessary.

Recent increases in the number of dairy cattle on the project show a very healthy tone. One of the most hopeful aspects of this increase in the dairy population is the fact that the expansion is from within. Large percentages of the dairy heifers during the past two or three years have been sired by very excellent dairy bulls. This promising young stock having been well cared for is increasing the size of the herds, and new herds are being added to the project. This young stock is acclimated and promises an excellent future. Until recently the project has been largely dependent on importations of dairy stock. These have brought many unforeseen discouragements.

The marketing of dairy products on the project has never been a subject of very great concern. For the past 10 years the dairymen have had a practically free choice of markets for butterfat. There has been no marketing of any other form of dairy products except whole milk for local consumption. This has no doubt been advantageous to the upbuilding of the dairy herds. The skim milk has been left on the farm for feeding calves, poultry, and pigs. Buyers of cream from dairymen have been plentiful enough to afford competition and to keep the price of butterfat much the same as in California dairy districts. In addition to the local creamery, which has operated continuously, creameries located in Reno, Nev., and at Oakland, San Francisco, and Oakdale, Calif., have been competing for some time in the Fallon district. The price of butterfat locally has been maintained at approximately 1 cent above the San Francisco quotations for extras throughout the year. The average Fallon quotation for the year 1923 was 48.6 cents.

The Holstein breed has found greater favor than any other on the project, and about 90 per cent of the dairy cows are of this breed. Jerseys and Guernseys have also proved to be well adapted to local conditions, and show excellent profits.

HERD-RECORD WORK

Herd-record work has been carried on with the dairy herds of the project for a number of years under the supervision of the United

States Department of Agriculture. During the past two years some very complete records have been obtained. These records serve to show what progress has been made in the quality of dairy cattle on the project and also the efficiency of their performance on a ration of alfalfa hay alone, such as it is customary to feed locally.

PRODUCTION, COSTS, AND RETURNS

The following data constitute a summary of herd-record work on the Newlands project during the year ended October 1, 1923:

Number of herds, 53 (including 702 cows).

Average lactation period of cows included in the test, 9.7 months.

Average production of milk, 7,060 pounds; average test, 3.73 per cent; average butterfat per cow, 263.4 pounds.

Returns per cow: Butterfat (at current monthly average price at Fallon), $132.96; skim milk at 25 cents per hundred, $16.88; total value of products, $149.84.

Production costs: Alfalfa hay was fed without limit. Each cow was charged with a quantity of hay equivalent to her own weight each month at $10 per ton. The average of the estimated weights of all cows in these calculations was 1,024 pounds.

Yearly value of hay consumed per cow, $61.45.

Butterfat produced per ton of hay, 42.7 pounds.

Hay required for each pound of butterfat, 46.6 pounds.

Average feed cost for producing 1 pound of butterfat, 17.4 cents.

Average returns for each dollar expended for feed, $2.46.

Average net returns in excess of feed cost per cow, $89.07. This amount should be placed against labor, interest charges, and depreciation.

ECONOMIC ANALYSIS BY GROUPS

The following is a grouping of the tested cows with respect to production, together with the feed cost of butterfat and returns for each dollar expended for feed:

Group 1.—Cows producing less than 200 pounds of butterfat. Of all cows in milk eight months or more 18.8 per cent belong in this group. These produced butterfat at a feed cost of 25 cents per pound and returned $1.77 in dairy products for each dollar spent for feed. A herd made up from this group will return $17.70 for each ton of hay consumed.

Group 2.—Cows producing 200 to 250 pounds of butterfat. Of all cows tested 20.4 per cent belong in this group. These produced butterfat at a feed cost of 20 cents per pound and returned $2.07 for each dollar spent for feed. A herd made up from this group will return $20.70 for each ton of hay consumed.

Group 3.—Cows producing 250 to 300 pounds of butterfat. Of all cows tested 28.2 per cent belong in this group. These produced butterfat at a feed cost of 16 cents per pound and returned $2.46 for each dollar spent for feed. A herd made up from this group will return $24.60 for each ton of hay consumed.

Group 4.—Cows producing 300 to 350 pounds of butterfat. Of all cows tested 14.4 per cent belong in this group. These produced butterfat at a feed cost of 13½ cents per pound and returned $2.76 for each dollar spent for feed. A herd made up from this group will return $27.60 for each ton of hay consumed.

Group 5.—Cows producing 350 to 400 pounds of butterfat. Of all cows tested 11.2 per cent belong in this group. These produced butterfat at a feed cost of 11 cents per pound and returned $3.12 for each dollar spent for feed. A herd made up from this group will return $31.20 for each ton of hay consumed.

Group 6.—Cows producing 400 pounds and over of butterfat. Of all cows tested 7 per cent belong in this group. These produced butterfat at a feed cost of 8 cents per pound and returned $3.70 for each dollar spent for feed. A herd made up from this group will return $37 for each ton of hay consumed.

Groups 3 to 6.—Of all cows tested 60.8 per cent produced 251 pounds and over of butterfat at an average feed cost of 17.3 cents per pound and returned $2.82 for each dollar spent for feed. A herd made up from this group will return $28.20 for each ton of hay consumed.

All cows included in the foregoing report by groups returned a margin above the cost of feed.

POULTRY RAISING

In establishing an industry in a locality the natural advantages should be of first consideration. The present development of the poultry industry on the Newlands project may be attributed more particularly to the natural advantages for poultry production than to any special propaganda. The very light precipitation throughout the year and the comparative freedom from fog or cloudy days make almost ideal conditions for successful poultry handling. The need for green feed through a large part of the year is supplied by alfalfa, which is universally grown, and this assists greatly in solving the feeding problem.

The control of poultry diseases has been a very simple matter thus far, and little fear is expressed by poultry raisers that difficulty from this cause will ever be serious. The sandy texture of the soil, which provides for excellent surface drainage, together with the bright sunlight, which is uninterrupted for an average of 230 days each year, are natural advantages in the control of contagious diseases.

Poultry raising is not carried on as an exclusive business, but is invariably associated with truck gardening or dairying. The industry fits in very well with either.

The tendency at the present time with dairymen is to keep a sufficient number of laying hens to use the surplus skim milk. There is no doubt that laying hens afford a higher price for skim milk than any other class of livestock.

Experiences during the past five years have shown that dairying and poultry raising have been the most dependable of all agricultural pursuits. The factors of supply and demand are more uniform and more equally balanced with poultry and dairy products than with any farm crops. Together with the natural advantages, this has served to stimulate a feeling of confidence in these activities on the project and forecasts a substantial development along these lines.

The markets for poultry products from this locality are very good, perhaps better than from other intermountain localities. Many sections of Nevada, especially the mining districts, do not produce poultry, and they provide an excellent near-by market.

TURKEYS

The raising of turkeys on the Newlands project is rapidly becoming an important industry. Experiences of project farmers have shown that a greater net profit can be made in a shorter time and with less initial investment than in almost any other farming activity. Because of this fact turkey raising has been very much favored by farmers with small means and especially appeals to new homesteaders who have much open land and need quick returns.

Climatic conditions have been found to be favorable to the raising of turkeys. The months of March, April, and May are remarkably free from stormy weather, a condition which is very essential to the hatching and brooding of young turkeys. Later in the season, when the turkeys are old enough to range, they find abundant food in the alfalfa fields, which are well-nigh universal on the project. It is a common practice in this connection to place the individual brooding coops, each coop containing one turkey hen with her young brood, on the borders of an alfalfa field, where irrigation does not interfere.

The young turkeys are given the freedom of the field, while the mother hen is confined.

The popularity of the industry has increased greatly during the last few years. The 1921 census report of the Bureau of Reclamation showed that 27 per cent of all ranchers raised turkeys; that for 1923 shows that 68 per cent of the ranchers were raising them on a commercial scale. These same census figures also show that the number of turkeys on farms increased from 4,834 in 1921 to 27,254 in 1923. The 1924 turkey crop showed every indication of surpassing the 1923 figures.

Feeding.—The feeding practices of local turkey raisers during the first month or more are perhaps not different from those in any other successful turkey-growing community. The use of the alfalfa fields for brooding purposes, however, affords free range for the young turkeys where they can obtain plenty of green feed and insects. This arrangement also prevents the crowding of young turkeys at any time on a small piece of ground, and much of the danger from contagious diseases to which they are subject thereby is eliminated.

It has become a common practice locally to provide fields of grain, including wheat, millet, and corn, where turkeys are allowed to range during their growing and fattening periods. This serves admirably to provide feed at low cost and with minimum labor.

Combating blackhead.—In all methods of handling turkeys, first consideration should be given to whatever will contribute most to holding in check the disease known as blackhead, which has been serious on the project, as elsewhere. The free-range handling, such as is practiced locally, helps greatly in this respect. The feeding of turkeys on contaminated ground is no doubt the most prolific means of spreading the disease.

Between 1917 and 1922, turkey raisers on the project suffered serious losses from blackhead, and much attention has been given to combating this disease. Various remedies have been tried, but often with rather unsatisfactory results. Constant attention to sanitary precautions is more beneficial than medication. Methods of preventive medication tested during the spring of 1924 gave very encouraging results.

Recent investigations indicate that the organism causing blackhead is associated with the intestinal worms prevalent among poultry. Local turkey raisers acting on this information have endeavored to free their brood stock from intestinal worms and carefully clean up the premises before the young turkeys are hatched, the course pursued being as here described.

Treatment for worms.—Pen the flock and keep from feed for 24 hours. Prepare a tobacco decoction as follows:

Take 1 pound of finely chopped tobacco (any form) for each 100 fowls. Cover with water and steep two hours. Mix this with a half ration of ground grain and feed to the fowls. Two hours after this feeding give a quarter ration of ground feed mixed with water to which has been added 0.75 pound of Epsom salt for each 100 birds. This treatment should cause the expulsion of worms and worm eggs, and all fowls should be confined for 24 hours after treatment, so that infection will not be widely scattered. After this treatment a thorough cleaning up is necessary, so that the birds will not reinfect themselves. This treatment should be repeated in two weeks.

Overfeeding has been found to increase the susceptibility of fowls to blackhead invasion.

The following poultry tonic and intestinal antiseptic treatment have proved beneficial locally in combating outbreaks of blackhead in turkey flocks in conjunction with the tobacco treatment:

Omit regular feeding in the morning. Prepare one-fourth ration of ground feed. For each 100 birds add in rounded tablespoonfuls 1 of nux vomica, 3 of powdered ginger, and 3 of black pepper. Add also a half ounce of powdered gentian. Mix well, moisten with water, and feed at noon. For the evening feeding take one-fourth ration of wet ground feed to which has been added 1 part of corrosive sublimate (tablets) to 6,000 parts of water and one 25-grain sulphocarbolate tablet dissolved in water for each 10 turkeys. Two days of this treatment in succession are recommended.

Marketing.—The marketing of turkeys from the project has been almost entirely by consignment to the cities on San Francisco Bay. Practically all turkeys are dressed before shipment. The price locally ranges about 8 cents per pound less than the San Francisco quotations. This margin is absorbed in transportation charges, commissions, shrinkage, and crates. The bay cities as a general rule have afforded a satisfactory market to local growers. The turkeys of the project have attracted attention in that market because of their superior quality. The designation "Fallon turkey" often appears on the bills of fare of leading hotels in San Francisco and also on the dining-car menu cards. This should eventually be a valuable asset to project turkey raisers.

It has been shown that the time of marketing turkeys is of less importance than the quality of the product marketed. In previous years the bulk of the output was rushed to market at Thanksgiving time without regard to the condition of the birds, but recent experience has shown that the Thanksgiving market may be a treacherous one and that the pre-Thanksgiving market often affords a better price. The Christmas and New Year seasons and winter months in general afford a dependable market for all well-finished stock.

CHICKENS

The raising of chickens on the Newlands project has shown a very rapid increase during the last three or four years. The 1923 census of the Bureau of Reclamation shows 45,240 chickens. These were practically all laying hens. At the time the census was taken the cockerels had been largely culled from the flocks in preparation for the winter laying season. According to this census 68 per cent of all farms had poultry. Of all farms 60 per cent had more than 25 hens each and are thus classed as devoted to the poultry business on a commercial scale, and 20 per cent of all farms had more than 100 hens each. A number of farms had 1,000 hens each.

The raising of chickens on the project is confined almost entirely to the White Leghorn breed, famous for egg production. Up to the present time there has been very little incubation of chicks in this locality. Baby chicks in large numbers are imported from the San Francisco Bay district of California, approximately 40,000 White Leghorn baby chicks being shipped into this valley each spring.

Some of the important towns of Nevada make heavy importations of eggs. These come very largely from California, because the supply from this State is insufficient. Owing to the proximity of this

valley to these poultry markets and the lack of competition there is an excellent opportunity for this industry.

Marketing practices have undergone radical changes during the past year. Heretofore all eggs marketed on the project were rated at the same price regardless of grade, but at the present time eggs are purchased subject to the San Francisco grades. The local price for eggs is based on San Francisco quotations, because of the fact that surplus eggs at any time eventually reach that market. This is also true of all meat chickens grown on the project. The local price for eggs is on a basis of 5 cents per dozen less than the San Francisco quotations for the same grade. This margin is absorbed in transportation charges and commissions. The average prices on the project for eggs during the year 1923 ranged from 22.16 cents per dozen during the summer to 58.41 cents during the winter

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